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The species of *HETEROCERUS* of Boreal America.

BY GEORGE H. HORN, M. D.

With most collectors *Heterocerus* does not seem to have been held in much regard. The species have been looked upon as almost inseparable, and the small amount of literature devoted to them has been practically inaccessible to nearly all. To myself they had been equally unattractive until the large material which had accumulated in a quarter of a century required to be dealt with and properly arranged, a task of no small difficulty in a mass of several hundreds from all parts of our country in every style of cabinet preparation.

In a work of this character, after the specimens have been uniformly mounted and prepared for study, the first essential step is the separation of the sexes. This is not a matter of much difficulty, although the males are far less numerous than the females. In the males the head is larger and more prominent, the mandibles more slender and projecting, the labrum longer, and in one group prolonged at middle in a process of varying length according to the species. The clypeus is also retuse to a varying degree, and is especially well marked in the species with a prolonged labrum. The thorax is at least as broad as the elytra, sometimes slightly broader, and not gradually narrowed to the front as in the female.

In one species, *pusillus*, the males have at the base of the mandibles a lobe prolonged over the labrum. Pl. 1, fig. 16.

The separation of the species, although much less difficult than had been supposed, is not a thoroughly easy task, and the large series before me, while rendering the attempt far more difficult than it would have been with a few score of specimens, has made it possible to determine the limits of variation with greater certainty.

The attempts at a monograph by Kiesenwetter were merely descriptions of species based for the most part on small series, separated without reference to structural characters. Color and sculpture afforded him the means of satisfactory separation, but with large series these are shown to have but little value.

In 1866, Schioedte attempted a division of the genus on characters drawn principally from the antennæ; *Augyles*, one of the subdivisions having but ten joints. The recognition has been shown by deGozis to be extremely difficult and uncertain, and therefore of doubtful value. In 1872, Mulsant and Rey proposed a means of subdivision based on characters of far easier observation and giving apparently more satisfactory results.

It was observed by them that in certain species the elevated curved line on the first ventral segment extended from the front angle by a broad curve toward the middle of the posterior edge of the segment and there terminated, while in others the line continued the curve forward toward the inner edge of the coxa. In the former case the abdominal plates are called open (*plaques abdominales ouvertes*) and in the latter entire (*plaques abdominales entières*). For the species with entire plates the name *Augyles* was erroneously adopted, which deGozis has proposed to change to *Littorimus* (Rev. Ent. 1885, p. 120). In our fauna but one species is known to belong here, *auromicans*.

Recently Dr. Sharp* has observed a character of considerable importance in its application to the grouping of the species. In rather more than half our species there will be observed on the metasternum an elevated line which begins at the middle of the posterior border of the middle coxa, extending obliquely backward joining the suture between the metasternum and its episternum. That this has anything to do with stridulation as suggested by Dr. Sharp seems to me extremely doubtful from its character as well as

* Biol. Cent. Am. vol. i, pt. 2, p. 116.

from its position in relation to the line of motion of the middle leg. In the following pages this line is designated as the *post-mesocoxal line*.

In two of our species, *gemmatus* and *auromicans*, there will be observed near the base of the epipleuron an elevated oblique line, beginning at the inner epipleural edge posterior to the anterior end of the met-episternum and directed obliquely forward and outward to the humeral angle. Although this character is possessed by but two species, it enables us to separate one of them from another so closely allied as to be almost inseparable without its use.

C. G. Thomson has made a certain use of the number of spinous hairs on the lower edge of the front femur, but without useful result.

While the characters drawn from the markings have, on the whole, but little value, there is one point of considerable utility. In a number of species there exists a pale spot at the middle of the base of each elytron more or less prolonged backward. This is very constant in the species to which it is known to belong, and has as much value here as a similar white spot at the middle of the base of the elytra in certain groups of *Cicindela*. In fact, the fully developed markings of *Heterocerus* are decidedly *Cicindeloid* in type.

In sculpture of the elytra the species vary greatly within specific limits. While in a few species the elytra are not at all, or very rarely, substriate, the larger number of species are distinctly substriate in about half the specimens, the remaining half being either without trace of striæ, or having them but feebly distinct. When the striæ are distinct the fifth is gradually deeper toward the base and forms a basal marginal depression which extends to the middle. The punctuation varies similarly; the large majority of specimens have a close and fine punctuation, scarcely perceptible under the pubescence, but individuals occur with a coarse and conspicuous punctuation. In these latter the elytral markings are usually obliterated. In one species (*Schwarzi*) all the specimens are rather coarsely punctate and the markings remain well defined.

The vestiture of the species consists of a moderately dense, but short, semi-erect pubescence of dark brown color, but paler on the bands or on the spaces where the bands should be. The entire margin is fimbriate with longer hair, more conspicuous on the thorax. In *auromicans*, however, the hairs are short, scale-like and not erect, and the margin is not fimbriate.

Considerable stress has been laid on the fact as to whether the base of the thorax has a marginal line, but as far as our species are known to me it exists in all, but varies in the sharpness of its definition.

With the structural characters already referred to it is proposed to arrange our species in the following manner:

Stridulating ridge of first ventral segment incomplete, *i. e.*, extending from the front angle in a curved line merely to the posterior border of the segment.

Heterocerus.

Stridulating ridge of first ventral segment complete, *i. e.*, forming nearly a semi-circle from the front angle to the posterior border, then recurving to the inner coxal border..... **Littorimus.**

All our species belong to *Heterocerus proper*, excepting *auromicans*, which belongs to *Littorimus*.

The species of *Heterocerus proper* may be separated in the following manner:

Subgenus **HETEROCERUS.**

Metasternum without post-mesocoxal line.....2.

Metasternum with post-mesocoxal line..... 5.

2.—Labrum of male narrowed at tip and prolonged in a process of greater or less length.....3.

Labrum of male not prolonged in a process.....4.

3.—Process of male labrum long and narrow.....**gnatho.**

Process of male labrum not longer than half the body of labrum, and not abruptly formed.

Elytra in greater part pale, with indistinct fuscous markings; thorax with sides broadly paler.....**pallidus.**

Elytra piceous, with the usual pale fasciæ more or less developed.

ventralis,

4.—Mandibles not prominent in male; elytra never with juxta scutellar spot.

undatus.

Thorax with entire pale border..... var. **undatus.**

Thorax with front angles yellow..... var. **mollinus.**

Thorax entirely piceous..... var. **fatuus.**

5.—Mandibles of male without basal lobe extending over the labrum.....6.

Mandibles of male with basal lobe.....10.

6.—Epipleuræ with oblique elevated line near the base; thorax entirely piceous; elytra without juxta-scutellar spot.....**gemmatus.**

Epipleuræ without oblique elevated line.....7.

7.—Elytra without juxta-scutellar pale spot.....8.

Elytra with juxta-scutellar pale spot.....9.

8.—Large species; legs more or less piceous; elytra usually substriate, the pale fasciæ much broken and never broad..... **brunneus.**

Smaller species; legs entirely pale; elytral markings well defined and broad, usually entire, surface not substriate..... **Schwarzi.**

- 9.—General color of upper surface brownish, often quite pale in the small specimens, thorax merely slightly darker at middle, rarely entirely brown; mandibles of male with a basal lobe on outer side more or less angulate.

collaris.

General color piceous, thorax piceous, often sharply bordered with pale; mandibles of male not prominent at base; elytral markings tending to form vittæ..... **tristis.**

- 10.—General color pale, often entirely so or with a broad thoracic space and an equally broad sutural space on the elytra fuscous..... **pusillus.**

Subgenus **LITTORIMUS.**

Metasternum with post-coxal line; epipleuræ with oblique elevated line near the base; stridulating line of first ventral segment entire..... **auromicans.**

H. guatho Lec.—Oblong, moderately convex, piceous, clothed with short, semi-erect brownish hairs, the entire margin fimbriate with longer hairs, elytra with the usual sinuous bands more or less interrupted and with a juxta-scutellar basal spot. Antennæ ferruginous. Head densely, finely punctured and opaque. Thorax fully twice as wide as long, sides moderately arcuate, narrower in front in ♀, base arcuate, oblique each side and with a distinct marginal line, disc moderately convex, densely punctulate and with longer pubescence (as also the head) than on the elytra; color entirely piceous, the anterior angles often yellow. Elytra nearly parallel, disc vaguely substriate, surface densely punctulate, a little more coarsely than on the thorax, color piceous, with the usual sinuous reddish yellow bands more or less interrupted, a recurrent lunule near the apex, a spot more or less triangular at basal margin on each side of scutellum. Epipleuræ yellow. Body beneath piceous, more shining and less pubescent than above, anterior angles of thorax, tip of prosternal lobe and sides and apex of abdomen yellow; abdomen, densely, punctulate. Femora yellow, tibiæ and tarsi piceous. Length .16—.22 inch.; 4—5.5 mm. Pl. 1, fig. 1.

Male.—Labrum broader than long, the middle third of the apex abruptly prolonged in a process as long as the body of labrum, the tip emarginate, the upper side carinate. Mandibles slender and long, the post-apical teeth small, without trace of basal lobe on the outer side. Front slightly retuse. Thorax a little broader than the elytra, sides arcuate, not narrower to the front.

Female.—Labrum broader than long, oval, the middle of apex with two short, obtuse teeth and on each side a slight sinuation. Mandibles shorter and broader than in the male and with the teeth well marked. Front continuous with the labrum. Thorax not broader than the elytra, distinctly narrowed to the front.

Variations.—The sinuous bands may begin at the lateral margin independently, but many specimens occur with an entire yellow border from base to apex. The bands are variably interrupted, but there is no great difference in this respect. In immature specimens the elytra are nearly as pale as in *pallidus*; such formed the types of the species.

The male will be easily known by the form of the labrum from any species in our fauna. The female having the juxta-scutellar

spot could only be mistaken (in description) for *pallidus* or *undatus*, both of which have the sides of thorax broadly paler, or for *collaris* and *tristis*, both of which have the meso-coxal line.

After an examination of the types of *gnatho* and *labratus* (labia- tus ||) it has been found that the two are absolutely identical, except as to color. The types of *gnatho* are merely pale specimens.

Occurs in the southern portion of California and the adjacent regions of Arizona, probably extending also into Mexico.

H. pallidus Say.—Oblong, feebly convex, piceous, the elytra in great part pale luteous, sides of thorax broadly pale, surface clothed with short, semi-erect pubescence, fulvous on the paler parts, brownish elsewhere, entire margin fimbriate with longer hairs. Antennæ pale testaceous. Head dark brown, densely punctulate. Thorax fully twice as wide as long, wider in the male, base arcuate, slightly oblique each side with a distinct marginal line, disc moderately convex, densely finely punctulate, color brown or piceous, the sides broadly yellowish. Elytra parallel ♀, or slightly narrower behind ♂, disc faintly striate, surface densely finely punctulate, general color pale luteous, with indistinct brownish markings. Epipleuræ pale. Body beneath piceous, the sides of prothorax and abdomen, the entire last ventral segment pale. Abdomen closely, but very minutely punctulate. Legs entirely pale yellow. Length .17–.22 inch.; 4.5–5.5 mm. Pl. 1, fig. 2.

Male.—Labrum broader than long, the middle third of apical margin prolonged in a process about one-third the length of the body of labrum and emarginate at tip. Mandibles slender, moderately long, the teeth small and near the apex. Front slightly retuse. Thorax more than twice as wide as long, sides regularly arcuate, not narrowed in front.

Female.—Labrum oval, narrowed in front, a slight emargination at middle. Mandibles shorter and stouter than in the male, the teeth more evident. Thorax twice as wide as long, sides arcuate and distinctly narrowed in front.

Variations.—The thorax may be almost entirely piceous. The elytra vary also in the extent of the pallid color, which is really only the expansion of the usual sinuous bands of the other species, so that merely indistinct fuscous markings appear. The underside of body may vary from the described form which is in great part piceous, to entirely pale, as in the specimens described by Say.

The male is readily known. The female, when small, might be mistaken for *collaris*, but there is no meso-coxal line in *pallidus*. The pale elytra and entirely yellow legs will distinguish either sex from any of the species in which the male has the prolonged labrum.

Occurs in western Kansas (Popenoe) to El Paso, Texas and Ariz.

H. ventralis Mels.—Oblong, feebly convex, piceous, clothed with short, semi-erect fulvous or brownish pubescence, the entire margin fimbriate with longer hair, anterior angles of thorax yellow, sometimes the entire side; elytra

with the usual sinuous bands always interrupted and sometimes indistinct, rarely a basal spot. Antennæ piceous, the basal joint paler. Head densely finely punctulate. Thorax twice as wide as long, sides arcuate, base arcuate at middle, oblique each side and with a distinct marginal line, disc moderately convex, densely finely punctulate. Elytra parallel in both sexes, substriate, closely punctulate, sinuous bands interrupted on the disc and not united at the margin by a pale border. Epipleuræ piceous. Body beneath piceous, more shining than above, finely closely punctulate, anterior angles of prothorax, tip of prosternal lobe, sides and tip of abdomen narrowly yellow. Femora reddish yellow, piceous at base, tibiæ piceous, tarsi pale. Length .24 inch.; 6 mm. Pl. 1, figs. 3-4.

Male.—Labrum obliquely sinuately narrowed at apex, prolonged at middle in a process about one-half as long as the body of labrum, feebly emarginate at tip. Mandibles prolonged and slender, the post-apical teeth very indistinct; front retuse. Thorax rather more than twice as wide as long and slightly wider than the elytra, sides regularly arcuate, not narrowed in front.

Female.—Labrum broader than long, sinuate each side of apex, slightly prolonged at middle and with a slight emargination. Mandibles shorter and stouter than in the male, the teeth distinct. Thorax distinctly narrowed in front, not broader than the elytra.

Variations.—Beyond the varying degree of interruption of the sinuous bands no differences have been observed beyond those given in the description.

From all the species which precede this may be known by the absence of the juxta-scutellar yellow spot. The females bear a very close resemblance to *gemmatus* so common in the Pacific region, but the absence of a post-mesocoxal line in *ventralis* will enable the two to be separated. It is more difficult by description alone to separate the females of this and *undatus*, but the labrum of the latter is not sinuate each side and the emargination broader.

Occurs in Pennsylvania, New York, Ohio.

H. undatus Mels.—Oblong, moderately convex, piceous or brown, thorax variable, elytra with the usual sinuous bands more or less interrupted, a sub-apical lunule, but no basal spot, surface clothed with brownish pubescence, the entire margin distinctly fimbriate. Antennæ piceous. Head piceous, densely punctulate. Thorax twice as wide as long, sides arcuate, base arcuate, distinctly sinuate at the sides, the marginal line distinct, disc densely punctulate, sometimes entirely piceous, or with the front angles yellow, or the sides narrowly yellow. Elytra oblong, parallel in both sexes, usually substriate, often not so, the surface densely punctulate, piceous or brown, with the usual sinuous, more or less interrupted bands, which are sometimes united at the margin by an entire pale border; surface densely punctulate, the punctures varying in degree. Epipleuræ usually piceous, rarely either entirely pale, or pale at base only. Body beneath piceous, the front angle of prothorax sometimes, the sides of abdomen narrowly yellow. Abdomen densely finely punctulate. Femora yellowish or brown, tibiæ piceous. Length .16—.18 inch.; 4—4.5 mm. Pl. 1, fig. 6.

Male.—Labrum slightly broader than long, arcuately narrowed to the front, the apex emarginate at middle. Mandibles slightly prominent, the incisure of the upper margin rather deep. Front distinctly retuse. Thorax a little wider than the elytra, slightly narrowed in front.

Female.—Labrum shorter and broader than in the male, rather broadly emarginate truncate at apex. Mandibles not prominent, the incisure of the upper edge deep, but the lobular projection exterior to it less prominent. Thorax not wider than the elytra, very distinctly narrowed in front.

Variations.—The wide distribution of this species is probably the cause of its variability from the climatic influences to which it is subjected. In order that the variations may be understood the following sketch has been prepared :

Thorax entirely piceous.

Elytral markings almost entirely obliterated..... (— — —)

Elytral markings more or less distinct.

Elytra substriate substriatus.

Elytra not substriate..... miser.

Thorax with anterior angles yellow to a varying extent backwards.

mollinus = fatuus.

Thorax with sides narrowly pale from base to apex. Legs paler than in the preceding forms..... undatus Mels.

(— — —) Piceous black above and beneath including the legs, the front angle of prothorax and side of front ventral segment pale. Elytral markings almost entirely obliterated, their position indicated by paler gray hair; punctuation of elytra rather coarse and conspicuous.

substriatus Kies.—Color piceous, the elytral bands fairly distinct, the punctuation usual. Beneath piceous, the front angle of the prothorax and sides of abdomen paler. Femora in great part brownish or reddish yellow, tibiæ piceous.

The substriate character of this form, on which Kiesenwetter lays some stress, has no value whatever, as in all the species forms occur either substriate or not.

It is barely possible that the Kiesenwetter type of *substriatus* may be really a synonym of *brunneus*, as the specimens of this are more decidedly and uniformly striate than elsewhere.

miser Kies. is a small form of the above with similar color and sculpture, but without elytral striae.

mollinus Kies.—Piceous or brown, the front angles of thorax yellow sometimes to the middle. Elytral markings distinct. Body beneath similar to *substriatus*. Femora rufotestaceous, tibiæ brown or piceous.

fatuus Kies. is merely a smaller *mollinus*.

undatus Mels.—Piceous or brown, sides of thorax from base to apex bordered with yellow. Elytral markings always quite distinctly marked. Body beneath with a broader border of pale. Legs sometimes entirely pale, or with the tibiæ alone fuscous.

The larger females of this form resemble those females of *ventralis* in which the sides of the thorax are more or less pale, but in this species there is never a juxta-scutellar spot, on the elytra and in both sexes the labrum is rather differently formed.

Occurs from Canada and the New England States westward to Wyoming and from these points southward in the entire region east of the Rocky Mountains.

H. gemmatus n. sp.—Oblong, moderately convex, piceous black, clothed with the usual gray or fulvous pubescence, with longer hairs at the margin, elytra with the usual sinuous bands each nearly always broken into three oval spots. Antennæ piceous, the basal joint usually paler. Head densely punctulate. Thorax twice as wide as long, sides arcuate, base arcuate, and at the sides oblique, marginal line distinct, entire; disc moderately convex, densely punctulate, color entirely piceous when mature. Elytra parallel ♀, or slightly narrower posteriorly ♂, disc variably substriate, sometimes indistinctly, as often very evidently, surface densely punctulate, color piceous, the sinuous bands orange yellow, often very indistinct, each usually divided into three oval spots, a marginal spot near apex, another slightly in front of this. Epipleuræ piceous, an oblique elevated line near the base; metasternum with post-mesocoxal oblique line. Body beneath piceous black, more shining than the upper surface, the entire reflexed side of pronotum, tip of prosternal lobe, the sides and apex of abdomen narrowly, yellow. Abdomen densely, finely punctulate. Legs piceous, tarsi alone pale. Length .13—.25 inch.; 3.25—6.5 mm. Pl. 1, fig. 5.

Male.—Labrum broader than long, slightly narrowed in front, apical margin slightly emarginate at middle and on each side sinuate. Mandibles moderately long, the teeth small. Front slightly retuse behind the labrum. Thorax distinctly wider than the elytra, not narrowed in front. Elytra slightly narrowed from the humeri posteriorly.

Female.—Labrum scarcely differing from the male, except that it is a little shorter and the sinuations in front less distinct. Mandibles shorter and stouter, the teeth very well developed. Thorax slightly narrower than the elytra, narrowed in front. Elytra parallel.

Variations.—As will be seen by the measurement this species varies considerably in size as well as in the distinctness of the striæ. The markings vary greatly. In the greater number of specimens, the bands are completely broken up, in many, however, they are as in the form figured. Immature specimens have not only the bands perfect, but the entire side has a pale border and the epipleuræ also pale. In the specimens from the northern regions the vestiture is a distinct pubescence, while in those from the south (Los Angeles, etc.) the vestiture approaches that of *auromicans*.

In this species the thorax of the male is more convex, and the appearance more massive than usual. The differences between it and *ventralis* have already been referred to. Some small and slightly

immature specimens are before me with the bands quite well marked, these by their size and appearance resemble to a deceptive extent some of the forms of our eastern *undatus* (var. *mollinus*), but the presence of the mesocoxal and epipleural lines will at once separate the present species.

Occurs in the region from Washington southward through California to Arizona, also in western Nevada.

H. brunneus Mels.—Oblong, moderately convex, piceous, slightly shining, surface with the usual short, semi-erect pubescence, margin fimbriate with slightly longer hairs, elytra with the usual sinuous fasciæ, more or less interrupted and in some specimens scarcely distinct. Antennæ piceous, two basal joints somewhat paler. Head densely finely punctured, subopaque. Thorax fully twice as wide as long, sides arcuate, slightly narrowed in front in ♀, base feebly arcuate at middle, obliquely sinuate each side, the basal marginal line entire, disc moderately convex, extremely finely and densely punctulate, color entirely piceous, rarely with the front angles slightly yellowish. Elytra parallel, disc nearly always substrate, the punctuation variable, usually fine and dense, less commonly quite coarse and conspicuous, markings almost exactly as in *mollinus*, and at times almost entirely obliterated. Epipleuræ without basal oblique line. Body beneath, in mature specimens, entirely piceous. Metasternum with distinct post-mesocoxal line. Legs usually entirely piceous, but variable from maturity. Length .12—.16 inch.; 3—4 mm.

Male.—Labrum much broader than long, nearly semi-circular, apex entire. Mandibles not prominent; clypeus slightly convex. Thorax as broad as the elytra, very slightly narrowed in front.

Female.—Labrum twice as wide as long, broadly, but not deeply emarginate in front. Thorax distinctly narrower than the elytra and more narrowed in front than the male.

Variations.—As in all the other species, this one varies in the extent of the sinuous markings of the elytra, being at times complete, but usually broken into spots. In the vast majority the thorax is entirely piceous, but in some the front angles are paler. None have been seen with the entire border pale. The elytral sculpture varies in the punctuation and striation. In some the punctures are quite coarse and conspicuous, or again very fine. On the whole the specimens are more distinctly striate than in any other species, although this, too, is variable. The legs vary in color. In those specimens the markings distinct and entire and which have very often the bands united along the border, the legs when seen from beneath are almost entirely yellow, the upperside of the tibiæ is black. In the darker and indistinctly marked specimens, which are the most common, the legs are either entirely piceous or the front femora slightly yellow.

This species greatly resembles the smaller forms of *gemmatus*, and also *mollinus*, the latter more especially. With the former it agrees in having the post-mesocoxal line and differs in the absence of the epipleural line. From the latter, which has no post-mesocoxal line, it is easily known.

This species is widely distributed. California, Oregon, Nevada, Wyoming, Canada, Illinois, Nova Scotia, Nebraska, Louisiana and District of Columbia.

H. Schwarzii n. sp.—Oblong, convex, piceous, clothed with the usual semi-erect brownish pubescence, the margins fimbriate with longer hairs, elytra with the usual sinuous bands, which are usually broad, often broken into spots, these also large. Antennæ brownish, paler at base. Head densely punctate, clypeus emarginate. Thorax rather more than twice as wide as long, sides arcuate, narrowed in front, more distinctly so in the female, base distinctly sinuate each side, the marginal line well marked, disc convex, closely finely punctured; color entirely piceous. Elytra parallel, disc very vaguely substrate at middle near the base, the punctuation coarse and deep, closely, but not densely placed; color piceous brown, with the usual yellowish sinuous bands, which are often interrupted. Epipleuræ pale. Body beneath brownish, paler than the upper surface, sometimes almost entirely testaceous. Metasternum with distinct post-mesocoxal line. Abdomen closely punctulate, not densely pubescent. Legs entirely pale. Length .12 inch.; 3 mm. Pl. 1, fig. 10.

Male.—Labrum more than twice as wide as long, with a slight broad emargination at apex. Mandibles not prominent, front very slightly retuse. Thorax more broadly arcuate than in the female, less narrowed in front.

Female.—Labrum and mandibles scarcely differing from the male. Front not retuse, clypeus more distinctly emarginate. Thorax very distinctly narrowed in front.

Variations.—The only variation observed is in color, the markings being sometimes continuous, often broken into spots. The under-side varies from brown to yellow.

This species is very closely related to *collaris* in its small varieties, and the two are difficult to separate by any absolute character. The present is more robust and convex, the color above, especially the thorax, in great part piceous brown, the elytra always with faint traces of striæ. In none of the specimens of *collaris* have I observed the thorax approaching the dark color of the present species; it is at most pale brown with broadly paler sides.

Occurs in Burnet County, Texas, from Mr. E. A. Schwarz; also in the Lake Superior region (cab. LeConte) and near Allegheny, Pa. (Dr. Hamilton)

H. collaris Kies.—Oblong, moderately convex, fuscous or piceous, clothed in the usual manner with brownish hair, sides of thorax pale, elytra with the

usual sinuous bands and a juxta-scutellar basal spot yellow. Antennæ brown, the basal joints pale. Head piceous, densely punctulate. Thorax twice as wide as long, sides arcuate, base arcuate, slightly oblique each side, the marginal line distinct, disc moderately convex, densely punctulate, color piceous or brown, the sides indefinitely paler. Elytra parallel, more or less substriate, densely punctulate, color brown to piceous, the usual two sinuous bands more or less interrupted and often indistinct, a recurrent lunule near the apex and a juxta-scutellar spot. Epipleuræ pale. Body beneath piceous, the side of the prothorax, tip of prosternum, sides and apex of abdomen indefinitely, yellow. Metasternum with distinct mesocoxal line curved with the convexity anteriorly. Abdomen densely finely punctulate. Legs entirely yellow. Length .10—.18 inch.; 2.5—4.5 mm. Pl. 1, figs. 7-8.

Male.—Labrum broader than long, arcuately narrowed to apex and with a slight emargination at middle. Mandibles moderately prominent, the teeth small, at base on outer side a prominent lobe which forms a more or less distinct angulation at its front end. Front oblique, not retuse. Thorax as wide as the elytra, slightly narrowed in front.

Female.—Labrum similar in form to the male, but not as narrow in front. Mandibles more robust, the entire basal lobe arcuate, not forming a prominent angle in front. Thorax a little narrower than the elytra, narrowed in front.

Variations.—The general color has already been referred to. In the darker forms the sides of thorax are not completely bordered with yellow. The elytra are often without any trace of striæ and again very plainly striate. The sinuous bands in their extent and interruption vary here as in every other species.

Along the Gulf region from Florida to Texas, and even Arizona, a form occurs which is nearly as small as *pusillus*, and without some care would be mistaken for that. It is quite pale in color and the sinuous bands are so extended as to leave but a small region along the suture somewhat darker in color. The contrast between the larger forms of *collaris* and these small forms is so pronounced that with limited material one would be justified in giving it a distinct name, but with a series of one hundred and twenty specimens before me with all gradations of size in color I feel satisfied that they are all one variable species.

The form of *collaris* is rather more slender than in the species of its size. The only other species which has at the same time a juxta-scutellar spot and the mesocoxal line is *tristis*, which has a broader form, piceous tibiæ, and the mandibles have not in either sex a prominent lobe on either side of base.

This species has a wide distribution. From Allegheny, Pa. (Hamilton), Ohio (Dury), Illinois (Strumberg), Florida (Schwarz), Texas (Schaupp), New Mexico (Wickham), Arizona (Morrison),

southern California (*Xantus*). The specimens from the southwestern regions are generally larger.

H. tristis Mann.—Oblong, subdepressed, piceous, rather sparsely clothed with the usual short brownish pubescence, longer on the head and thorax, sides of thorax indistinctly paler, more broadly in front, lateral margin entirely but narrowly pale, the usual sinuous bands much broken into short longitudinal lines, the juxta-scutellar spot forming a rather long stripe, on each side of this one-third from base a short stripe, more posteriorly a pair of lines the inner oblique, the outer longitudinal, behind these two more, both slightly oblique, sometimes united. Antennæ piceous. Head piceous, densely punctulate. Thorax rather more than twice as wide as long, sides arcuate, base arcuate, slightly oblique each side, marginal line distinct, color piceous, with an indistinct yellow border, wider in front. Elytra parallel, vaguely substriate, punctuation close, variable in coarseness; epipleuræ pale. Body beneath piceous, sides of prothorax and abdomen narrowly, yellow. Metasternum with distinct mesocoxal line. Abdomen closely punctulate. Femora and tarsi pale, tibiæ piceous. Length .12—.18 inch.; 3—4.5 mm. Pl. 1, fig. 9.

Male.—Labrum broader than long, arcuately narrowed to the tip, apex emarginate at middle. Mandibles scarcely prominent, with scarcely evident basal lobe on outer side. Front slightly retuse. Thorax as wide as the elytra, arcuately narrowed to the front.

Female.—Labrum shorter and more obtuse in front than in male; mandibles stouter. Front not retuse. Thorax a little narrower than the elytra and more narrowed in front.

Variations.—For a species in which the bands are so much broken as to lose almost all trace of their sinuous relationship, the markings are remarkably permanent, becoming merely a little broader and occasionally slightly confluent.

In the remarks on the differential characters of the preceding species, those with which this might be confounded have been referred to and need not be repeated here.

In distribution this species seems essentially northern. Massachusetts (Blanchard), New York, Philadelphia (Liebeck), Canada, Wisconsin, Dakota, Nevada and Sitkha (Motschulsky).

H. pusillus Say.—Oblong, moderately convex, yellowish testaceous to pale fuscous, either entirely uniform in color, or with a broad darker band through the centre of the upperside, surface with short yellowish pubescence, the margin slightly fimbriate. Antennæ testaceous. Head fuscous, densely punctulate. Thorax twice as wide as long, sides arcuate, base arcuate at middle, distinctly sinuate each side with a distinct marginal line, disc convex, closely, but extremely minutely punctulate, color either entirely pale or with a broad central space darker. Elytra parallel not substriate, closely but indistinctly punctulate, color either uniform testaceous varying to a broad median space darker in color, not reaching the apex. Epipleuræ pale. Body beneath a little

darker in color than above, abdomen closely but indistinctly punctulate. Metasternum with mesocoxal line, which is, however, indistinct. Legs entirely pale. Length .98—.10 inch.; 2—2.5 mm. Pl. 1, fig. 12.

Male.—Labrum broader than long, narrowed to apex, the tip entire. Mandibles not prominent, but with a basal lobe prolonged from the inner side over the base of labrum in front of the clypeus. Thorax as wide as the elytra, sides arcuate, not narrowed in front.

Female.—Labrum similar to that of male, but broadly truncate at apex. Mandibles without basal lobe. Thorax distinctly narrowed in front.

Variations.—Many specimens are entirely testaceous in color with the head alone darker, these are *luteolus* Lec. and when slightly ferruginous are typical of *pusillus* Say. By far the larger number have the greater portion of the disc of thorax pale fuscous, the margins broadly pale and with an equally broad fuscous space on the elytra not reaching the apex, these are *limbatus* Kies. Rarely the darker space on the elytra is narrowed to a vitta on each elytron.

The only species with which this might be confused is *collaris*, in its very small form. The males are readily known. The females are difficult to separate in description, but it will be observed that the markings of the elytra in *collaris* although indistinct, are of the sinuous band type.

Occurs from Allegheny, Pa. (Hamilton), westwardly to Illinois, thence to Texas, Arizona, southern California and northern Mexico.

H. auromicans Kies.—Oblong, convex, more obtuse at the extremities than usual, surface sparsely clothed with golden, short, scale-like, recumbent hairs, the margin not fimbriate, color piceous, sides and median stripe of thorax pale, elytra with sides, two sinuous vittæ and short subapical lunule yellow. Antennæ pale brown. Head piceous, densely punctulate. Thorax twice as wide as long, sides feebly arcuate posteriorly, more strongly in front, base arcuate, slightly oblique each side, the marginal line very distinct, hind angles more defined than usual, surface rather more coarsely and less closely punctate than usual in the genus; color piceous, the sides and a median stripe paler, these of variable width. Elytra parallel, substriate, closely punctulate, color piceous, the entire lateral margin narrowly yellow, two sinuous bands, the anterior very oblique, the posterior more transverse, near apex a rudiment of a recurrent lunule. Epipleuræ pale, an oblique elevated line near the base. Body beneath piceous black, the prothorax in great part yellow, abdomen, in feebly mature specimens, piceous the tip of the last segment and a spot on each side of the two preceding yellow. Metasternum with distinct mesocoxal line. Stridulating ridge of first ventral segment entire. Femora and tarsi rufotestaceous, tibiæ piceous. Length .12—.16 inch.; 3—4 mm. Pl. 1, fig. 11.

Male.—Labrum transverse, narrowed in front, apex emarginato-truncate. Mandibles slightly prominent, the teeth small. Clypeus slightly emarginate, front slightly retuse. Thorax more than twice as wide as long, slightly wider than the elytra, sides suddenly arcuate at the front and abruptly narrowed to the head.

Female.—Labrum and mandibles shorter than in the male. Thorax twice as wide as long, not wider than the elytra, sides regularly arcuately narrowing from base to apex.

Variations.—The only variations are in color. In one female the thorax has no median pale stripe. The elytral bands are always continuous, but vary in width. Changes in color from less maturity can easily be accounted for.

An easily known species from the vestiture and the absence of marginal ciliæ. On the intervals of the elytra there are distantly placed longer and more prominent golden hairs. In glancing over the species before me it seems hardly possible to mistake this species for any other. It and *gemmatus* are remarkable in having an elevated oblique line on the epipleuræ near the base.

This species is remarkable in being the only one in our fauna in which the stridulating ridge of the first ventral is entire. The ridge begins in the usual manner at the outer front angle of the first segments curves obliquely backward toward the posterior border then bends rather abruptly forward and extends obliquely to the point of articulation of the trochanter with the coxal angle.

Occurs from Canada through the Middle States to Texas and as far west as Michigan, Wisconsin and Kansas.

Before concluding this paper it is proper to indicate the material used :

The LeConte cabinet has been carefully studied on the occasion of several visits. It contains the types of his own species besides those of Melsheimer. In addition there are several which have been sent by Schaum, and which formed part of the material used by Kiesewetter, viz.: *collaris*, *limbatus*, *fatuus*, *mollinus*, *cuniculus* and *auromicans*.

Mr. H. Ulke, of Washington, with his usual kindness, has loaned me his entire and very full series.

Mr. Samuel Henshaw has added for study several hundred from all parts of the country.

Mr. E. A. Schwarz has also loaned interesting material and added one new species to the list.

Mr. M. L. Linell a very useful series collected near N. Y. City.

Of the species studied *H. Schwarzi* has been represented by thirteen specimens, the remaining species have been studied from more than twenty-five examples, while in *undatus*, *collaris*, *limbatus* and *gemmatus*, hundreds of each have been before me.

While in all parts of the coleopterous series an abundant series is useful, in *Heterocerus* a very large series is absolutely necessary, and the more specimens examined the greater the difficulty in defining the species and the greater necessity for the use of judgment in placing specimens. About half of the species are separable by structural characters of a positive nature, while others, especially *collaris* and *undatus* are extremely difficult to define.

HETERO CERUS Bosc.

- H. *gnatho* Lec., New Species, 1863, p. 74.
labratus Lec., List Col. N. A. p. 35; *labiatus* (||) Lec., New Species, 1863, p. 75, err. typ.
- H. *pallidus* Say, Journ. Acad. iii, p. 199; edit. Lec. ii, p. 127.
- H. *ventralis* Mels., Proc. Acad. ii, p. 98.
labiatus Kies., Revis. Linn. Ent. v, 1851, p. 232.
- H. *undatus* Mels., Proc. Acad. ii, p. 98; Kies., loc. cit. p. 293.
 var. *cuniculus* Kies., loc. cit. p. 283.
 var. *substriatus* Kies., loc. cit. p. 290.
miser Kies., loc. cit. p. 290.
 var. *mollinus* Kies., loc. cit. p. 289.
fatuus Kies., loc. cit. p. 292.
- H. *gemmatus* n. sp. (idem LeConte in cab.)
- H. *brunneus* Mels. Proc. Acad. ii, p. 91.
flavipes Lec., mss.
- H. *Schwarzi* n. sp.
- H. *collaris* Kies., loc. cit. p. 292.
ornatulus and *fuscipes* Lec., mss.
vilis Sharp, Biol. Cent. Am. i, 2, p. 773.
- H. *tristis* Mann., Bull. Mosc. 1853, iii, p. 218.
- H. *pusillus* Say, Journ. Acad. iii, p. 200; edit. Lec. ii, p. 128.
limbatus Kies. Germ. Zeit. iv, 1843, p. 215, pl. 3, fig. 13.
luteolus Lec., New Species, p. 75.
americanus Sharp, Biol. Cent. Am. i, 2, p. 772.
- H. *auromicans* Kies., loc. cit. p. 287.

Among the species described by Dr. Sharp, from Mexico, *velutinus* should be compared with *gnatho* Lec., and *mexicanus* with *collaris*.

EXPLANATION OF PLATE I.

- Fig. 1.—H. *gnatho* ♂ Lec.
 “ 2.—H. *pallidus* ♂ Say.
 “ 3.—H. *ventralis* ♂ Mels.
 “ 4.—H. *ventralis* ♀ var.
 “ 5.—H. *gemmatus* ♂ Horn.
 “ 6.—H. *undatus* ♀ Mels.
 “ 7.—H. *collaris* ♂ Kies. The usual longer form from Arizona.
 “ 8.—H. *collaris* small variety.
 “ 9.—H. *tristis* ♀ Mann.
 “ 10.—H. *Schwarzi* ♀ Horn.
 “ 11.—H. *auromicans* Kies.
 “ 12.—H. *pusillus* Say, var. *limbatus* Kies.
 “ 13.—Head of *gnatho* ♂.
 “ 14.— “ *brunneus* ♂.
 “ 15.— “ *gemmatus* ♂.
 “ 16.— “ *pusillus* ♂.
 “ 17.—Mandible of *pusillus* ♂.

